Chapter 2
Epidemiology of Chronic Postsurgical Pain

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Abstract Chronic postsurgical pain has a global incidence of 30 %, while surgery is the second commonest cause of neuropathic pain. The operations most commonly implicated in chronic postsurgical pain are inguinal hernia repair, breast surgery, amputation, cholecystectomy and thoracotomy. Possible risk factors are the existence of preoperative pain, psychological characteristics of the patient, certain aspects of surgical technique and intense postoperative pain. The recommendations formally set out by experts for the management of postoperative pain include an assessment of the incidence of chronic postsurgical pain and suggest ways of predicting and preventing it.

Key points

- Chronic postsurgical pain has a global incidence of 30 %.
- Surgery is the second commonest cause of neuropathic pain.
- The operations most commonly implicated in chronic postsurgical pain are inguinal hernia repair, breast surgery, amputation, cholecystectomy and thoracotomy.
- Possible risk factors are the existence of preoperative pain, certain aspects of surgical technique and intense postoperative pain.
- The recommendations formally set out by experts for the management of postoperative pain include an assessment of the incidence of chronic postsurgical pain and suggest ways of predicting and preventing it.

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Introduction

Surgery causes postoperative pain as a result of tissue trauma and the resulting inflammation. In some types of surgery there is epidemiological data to support the possibility that postsurgical pain persists in a chronic form [1]. We will be addressing here the incidence and clinical significance of chronic pain that becomes established in this way after the main operations for which data are available. We will then attempt to analyse the risk factors for chronic pain on the basis of epidemiological data.

Chronic Postsurgical Pain: Definition, Incidence, Clinical Characteristics and Risk Factors

Definition

The term chronic postsurgical pain (CPSP) is used when the pain is chronic (>2 months) after a surgical procedure, has no other identified etiology and is not continuous with a preoperative problem [2].

How Should the Incidence of CPSP be Assessed?

The incidence of CPSP can be assessed by prospectively following up patients who have undergone specific types of operations over a sufficiently long period. The advantage of this approach is that data on the patient's background and history and information on immediate postoperative management can be gathered prospectively, together with an assessment of the intensity of postoperative pain, the level of hyperalgesia and the precise medications prescribed. The patients must then be followed up for at least three months with at least one follow-up questionnaire and preferably with repeated clinical examinations. The latter approach is more complex but it should still be preferred. Another approach involves studying patients who already have chronic pain, with a retrospective analysis of the type of the operation and patient management aspects. This approach is simpler, but it excludes patients who do not develop CPSP from the outset and it does not create any opportunities to gather data on risk factors.

Overall Incidence

The incidence of surgery has increased considerably in recent decades. By extrapolating the frequency of CPSP to different surgical models, it is known that

the number of new cases each year may be somewhere between 394,000 to 1,500,000 in the United States and between 41,000 and 103,000 in the United Kingdom [2]. In France we know that the number of operations rose by 120 % between 1980 and 1996 but we do not know whether this is responsible for a parallel increase in CPSP.

For the last 10 years, since the review was carried out by Perkins et al. [1], more epidemiological data has been gathered in relation to CPSP [2]. Perkins et al. were the first to synthesise the epidemiological data in this area [1]. For five types of operation (laparoscopic cholecystectomy, thoracotomy, amputation, inguinal hernia and mastectomy), these authors analysed the incidence, clinical characteristics and potential risk factors for the establishment of chronic pain after surgery. Overall it appears that the frequency of CPSP is high at between 10 and 80 % depending on the surgical context and the individual study [1]. In these five surgical models, the studies described an incidence of chronic pain of 30–80 % in the case of phantom limb pain, over 50 % for post-thoracotomy pain, 10–57 % after mastectomy, 3–50 % after cholecystectomy and 0–37 % after inguinal hernia repair. Clinical data has also emphasised the existence of pain which continues for several months after abdominal [3], prostate [4], cardiac [5, 6] and orthopaedic operations [7]. The specific data on CPSP for each type of surgery will be addressed in other parts of this work. In general it appears that the use of longer periods of follow-up for patients in clinical studies of CPSP has revealed this syndrome, which has often been neglected by health care personnel and is rarely brought up by patients [1].

A survey by the French Society for the Study and Treatment of Pain, coordinated by Bruxelle in 2007, made it possible to analyse the causes of neuropathic pain in patients consulting chronic pain management services. In a group of 1,397 new patients, two-thirds of cases of neuropathic pain were due to three causes: 30 % due to radiculopathy; 25 % due to a purely surgical cause (47 % if the surgery is considered to be at least partly involved) and 8 % post-traumatic. Surgery can therefore be considered as the second commonest cause of chronic neuropathic pain in France that receives specialist care. Another key fact emerging from this survey was the observation that the diagnosis is frequently delayed (36 %) or not given (35 %), with symptoms frequently evolving over more than three years and a major impact on quality of life. In the case of complex regional pain syndrome, which in some cases is a type of CPSP, the estimated overall incidence is 16.4 %. This incidence varies depending on the type of surgery, with 2.3–4 % for arthroscopy, 2.1–5 % for carpal tunnel nerve decompression, 7–37 % after surgery for wrist fractures, 4.5–40 % after surgery for Dupuytren's disease, 13.6 % after ankle surgery and 0.8–13 % after total hip prosthesis [8].

Clinical Characteristics

Neuropathic Component

One of the main points requiring clarification is the principal mechanism involved in the development of CPSP. A descriptive study involving more than 500 patients revealed that half of the 30 % of patients who had CPSP at three months had positive results on the DN4 questionnaire, which suggests a neuropathic element. This tended to show that at least 50 % of cases of CPSP have a component associated with a neurological injury.

Intensity

The intensity of the various types of CPSP varies considerably depending on the specific operation and the individual. It appears that after thoracotomy, studies describe residual pain which is frequent but not very intense [9], while others describe severe pain occurring with an incidence of 3–5 % [10]. Phantom limb pain after surgical amputation appears to be marked by intense CPSP type pain, which occurs frequently [11].

Functional Impairment

The functional impact of CPSP varies, with few consequences in some cases [9], or 50 and 72 % of patients with pain respectively describing a functional handicap after thoracotomy [10] or aortocoronary bypass [5]. It must also be emphasised that in some surgical situations there is characteristically preoperative pain, so in these cases the persistence of chronic pain poses specific diagnostic problems, as after coronary surgery [5], thoracic surgery for cancer [12] or bladder surgery, or where the functional benefit of surgery is questioned after aortocoronary bypass [5]. Finally, some forms of CPSP are associated with sexual dysfunction [13].

Risk Factors

In the various situations in which CPSP occurs, it is helpful to look for the associated factors that may point towards a specific cause or mechanism or to one that is common to them all, with the aim of gaining a better understanding of the mechanisms involved and possibly developing preventative measures or treatments. The review carried out by Perkins et al. revealed preoperative predisposing factors such as the existence of preoperative pain, iterative surgery, psychological fragility, an industrial accident context; perioperative factors such as the severity

of nerve injuries; postoperative factors, such as the existence of moderate to severe postoperative pain, associated treatments (chemotherapy, radiotherapy); psychological factors and other factors including the need for repeated surgery [1].

A history of preoperative pain during the month prior to the operation suggests that preoperative sensitisation of the central nervous system has an impact. This situation seems to be common, with an overall incidence of 62.7 % of patients undergoing surgery in France who had pain at the site of the operation prior to surgery, from a national audit in France covering 1,900 patients who underwent various types of surgery [14]. Preoperative pain was generally moderate at rest at 4.3 (2.8) and increased on movement 6.4 (2.2); it did seem to be chronic and had evolved over more than one year in 35.6 % of cases [14]. This type of pathophysiological link is supported by clinical studies showing that preoperative pain predicts postoperative morphine intake [15] or that the type of preoperative pain predicts the occurrence of postoperative hyperalgesia [16]. The impact of preoperative pain on the development of CPSP has been well described in the case of pain after amputation in children [17] and after breast surgery [18]. There is some suggestion that preoperative sensitisation may occur, since data obtained in children show that prior nociceptive stimulation (circumcision) was able to exacerbate the pain response during vaccination carried out several months later [19, 20].

In the case of *perioperative factors*, one study showed that the importance of the nerve injuries caused by the operation was predictive of the occurrence of CPSP after thoracotomy [21]. This idea hasn't, however, been confirmed by other studies describing minimally invasive surgery, which reduces immediate postoperative pain without reducing the incidence of CPSP [22–24], or in other surgical models (inguinal hernia) where the nerve injury does not appear to determine the occurrence of CPSP [25, 26]. As regards the perioperative implantation of material, it has been showed that the implantation of a breast prosthesis increased the incidence of CPSP [1], while in the case of inguinal hernia, implanting a mesh reduced its incidence [27]. Analyses of the proportionality between the surgical trauma and the incidence of CPSP have yielded variable results. A reduction was seen in the incidence of CPSP in cases of laparoscopic surgery for inguinal hernia as compared with the traditional approach [27], and also in minimally invasive thoracotomy [28, 29]. In comparisons between laparoscopic and open cholecystectomy, on the other hand, as in comparisons of specific types of cardiac surgery [30, 31] or hysterectomy [32–34], the type does not affect the incidence of CPSP.

During the postoperative period, it appears that the intensity of the pain predicts the occurrence of chronic pain [1]. This has been observed quite consistently across the various surgical situations covered by the review carried out by Perkins et al. [1]. It is difficult, however, to define whether separate mechanisms account for the occurrence of chronic pain or whether associated factors are playing a part alongside the chronic pain to create a different initial surgical situation.

Analysis of a Specific Case: Iliac Graft Sampling

Iliac graft sampling is a procedure used in orthopaedic surgery to allow bone strengthening using bone allografts. This technique is used in spinal surgery, arthrodesis and arthroplasty. The immediate postoperative pain is intense and a high incidence of CPSP has been found to occur at the sampling site. We carried out a prospective study to describe the characteristics and features that increase the risk of CPSP. The usefulness of this clinical model is that it allows us to assess the importance of a nerve injury (lateral cutaneous nerve of the thigh) in parallel with clinical, histological and biological tools, as well as the severity of peri-scar hyperalgesia, measured in a different anatomical territory. It appears that the incidence of CPSP is at least 30 % and that it has neuropathic features. Predictive factors appear to be the patient's background, the existence of preoperative pain and the level of peri-scar hyperalgesia. Nerve injuries to the lateral cutaneous nerve of the thigh are very common, but when assessed at this stage in terms of clinical criteria, the severity of nerve injury is not the determining factor. This data shows that background factors (preoperative pain and the intensity of hyperalgesia) interact closely with a perioperative nerve injury to act as factors that can trigger CPSP. This type of detailed analysis creates an opportunity to better understand the links between a genetic background or factors in the medical history, acute pain, perioperative nerve injury and the risk of CPSP.

Conclusion

The incidence of CPSP is in all likelihood underestimated. The recommendations formally set out by experts on the management of postoperative pain and organised by the French Society for Anaesthesia and Intensive Care, updating its 1998 conference consensus, refer to the need to assess its incidence more effectively and propose a number of preventative measures [35–38]. CPSP is therefore given equal significance alongside other aims in the management of patients undergoing surgery. Its predictive factors are beginning to be better understood, and these include aspects related to the patient's background as well as a large number of preoperative and postoperative factors.

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